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EXAMINER	
DOUGHERTY, THOMAS M	
ART UNIT	**PAPER NUMBER**
2834	

DATE MAILED: 05/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)	
	09/584,881	HAGOOD ET AL.	
	Examin r	Art Unit	
	Thomas M. Dougherty	2834	

-- *The MAILING DATE of this communicati n appears on the cover sheet with the correspondenc address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *54-89* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *54-89* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 December 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 54 and 58-62, are rejected under 35 U.S.C. 102(b) as being anticipated by Crawley et al. (US 4,849,668). Crawley et al. show (fig. 2) a method for at least partially suppressing a vibration of a mechanical disturbance (flexing, see col. 2, ll. 12-14), comprising: measuring a characteristic of the disturbance using a sensor (10 and 112), and based on the measured characteristic, actuating an electrical circuit (202) to configure an electromechanical transducer (104, 106) coupled to the disturbance for acting on the disturbance to at least partially suppress the vibration.

The characteristic of the disturbance is selected from the group consisting of: vibration amplitude (generated by 10), vibration frequency, vibration mode, physical strain, position, displacement, pressure, force, orientation, acceleration, motion, and a combination thereof.

The sensor is selected from the group consisting of: strain gauge (col. 4, l. 63), pressure sensor, PVDF film, accelerometer, active fiber composite sensor, composite sensor, and a combination thereof.

The method including converting at least a portion of mechanical energy associated with the disturbance to electrical energy, using the transducer (10). See col. 4, ll. 63-67.

The method including applying at least a portion of the electrical energy to the electrical circuit (12).

The method including applying at least a portion of the electrical energy (output from 10) to the sensor (8).

Claims 54-67, 72, 73, 76, 82, 84 and 89 are rejected under 35 U.S.C. 102(e) as being anticipated by Dujari et al. (US 6,486,589). Dujari et al. show (fig. 2) a method for at least partially suppressing a vibration of a mechanical disturbance (see ABSTRACT, lines 17-20), comprising: measuring a characteristic of the disturbance using a sensor (8), and based on the measured characteristic, actuating an electrical circuit (12) to configure an electromechanical transducer (14) coupled to the disturbance for acting on the disturbance to at least partially suppress the vibration. See also the discussion at col. 2, lines 31-53.

The transducer (104, 106) at least approximately matches a phase of the disturbance to at least partially suppress the vibration. See col. 3, l. 62 to col. 4, l. 2.

The transducer (104, 106) at least approximately matches a motion of the disturbance to at least partially suppress the vibration. Note at col. 4, ll. 1-2 that the effect is to "counteract the flexing of circuit card 102".

The motion includes the highest frequency of the vibration. Note to counter the flexing, this is an inherent achievement to accomplishment of the counteraction of the flexing.

The characteristic of the disturbance is selected from the group consisting of: vibration amplitude, vibration frequency, vibration mode, physical strain, position, displacement (physical displacement of 110 causes voltage output to voltage sensor 112), pressure, force, orientation, acceleration, motion, and a combination thereof.

The sensor is selected from the group consisting of: strain gauge pressure sensor, PVDF film, accelerometer, active fiber composite sensor, composite sensor, and a combination thereof. Note that the sensor is comprised of a piezoelectric wafer crystal material which description includes composite materials.

The method including converting at least a portion of mechanical energy associated with the disturbance to electrical energy, using the transducer (110).

The method including applying at least a portion of the electrical energy to the electrical circuit (202).

The method including applying at least a portion of the electrical energy (output from 110) to the sensor (112).

Dujari et al. show (figs. 1A, 2) a system for at least partially suppressing a vibration of a mechanical disturbance, comprising: an electromechanical transducer

(104, 106) coupled to the disturbance and configured for exchanging mechanical energy with the disturbance, a sensor (110, 112) coupled to the disturbance for measuring a characteristic of the disturbance, and an electrical circuit (202, 204, 206) in communication with the sensor (110, 112) and coupled to the transducer (104, 106) to configure the transducer (104, 106) for acting on the disturbance to at least partially suppress the vibration, based on the measured characteristic, wherein the electrical circuit includes at least one active switch (that is in the trigger circuit, see. Col. 4, ll. 38-42 where Dujari et al. note that the oscillators 204 and 206 are turned on and off. Thus switching clearly takes place. As noted above, the transducer at least approximately matches a phase of the disturbance to at least partially suppress the vibration.

As noted above, the transducer at least approximately matches a motion of the disturbance to at least partially suppress the vibration.

As noted above the transducer is selected from the group consisting of: piezoelectric transducer, antiferroelectric transducer, electrostrictive transducer, piezomagnetic transducer, magnetostrictive transducer,magnetic shape memory transducer, and a combination thereof.

As noted above the sensor is selected from the group consisting of: strain gauge, pressure sensor, PVDF film, accelerometer, composite sensor, and a combination thereof.

The electrical circuit (202, 204, 206) includes a resonant circuit to at least approximately match a characteristic of the vibration. Note col. 3, ll. 13-15 that the card flexes at a resonant frequency. Further note that the applied frequency is omega,

defined as the "natural frequency of the dominant mode shape that is desired to be controlled" at col. 3, ll. 45-50.

The resonant circuit is coupled to the transducer to at least approximately match a behavior of the transducer. Note at col. 3, l. 66 to col. 4, l. 2 that the "flex wafers 104 and 106 work together to **counteract** the flexing of the circuit card 102."

The electrical circuit (202, 204, 206) includes a control circuit for controlling at least one of the at least one active switch. Note that as the application of voltage to the transducers is turned on an off, a control is implicit.

Their electrical circuit (202, 204, 206) includes an amplifier circuit coupled to the transducer (104, 106) for providing energy exchange between the electrical circuit (202, 204, 206) and the transducer (104, 106). See col. 4, l. 36 where amplitude adjustment is noted. See also claim 8.

The electrical circuit includes a control circuit for controlling the amplifier circuit. Again note that amplitude adjustment cited at col. 4, l. 36 indicates a control function.

Dujari et al. show a system for at least partially suppressing a vibration of a mechanical disturbance, comprising: an electromechanical transducer (110, 112) coupled to the disturbance and configured for converting at least a portion of mechanical energy associated with the disturbance to electrical energy, an electrical circuit (202) coupled to the transducer (110, 112) to process at least a portion of the electrical energy, wherein the electrical circuit includes at least one active switch (as noted above), and dissipating at least a portion of the processed electrical energy, thereby at least partially suppressing a vibration of the disturbance by reducing the

mechanical energy associated with the disturbance, via the application of counteracting voltage, as noted above.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 68 and 69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dujari et al. (US 6,486,589) in view of Hayes (US 5,779,149). Given the invention of Dujari et al. as noted above, they fail to show their sensor is coupled to the disturbance by a mechanical amplifier, or their sensor is coupled to the disturbance by a hydraulic amplifier.

Hayes teaches (col. 1, ll. 32-35) use of a mechanical amplifier, which is a hydraulic amplifier used for increasing the stroke of the piezoelectric actuator thereby compensating for tolerances and shifts due to temperature and wear.

Hayes doesn't show a system for at least partially suppressing a vibration of a mechanical disturbance.

It would have been obvious to one having ordinary skill in the art to use the hydraulic amplifier, shown by Hayes, in the device of Dujari et al. at the time their invention was made in order to at least compensate for tolerances and shifts due to temperature and wear, as Hayes notes.

Claims 70 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dujari et al. (US 6,486,589) in view of Okada (US 5,907,212). Given the invention of Dujari et al. as noted above, they fail to show the electrical components that make up their at least one active switch.

Okada shows (fig. 6) a driving circuit for a piezoelectric actuator wherein at least one active switch (e.g. 38) is selected from the group consisting of: MOSFET, **bipolar transistor** (not humbered), IGBT, SCR, and a combination thereof.

At least one of the at least one active switch includes a diode (not numbered).

Okada des not show a system for at least partially suppressing a vibration of a mechanical disturbance.

It would have been obvious to one having ordinary skill in the art to employ the active switch configuration of Okada in the device of Duraji et al. at the time their invention was made in order to achieve at least the high-speed driving of the transducer, such as is noted by Okada at col. 1, ll. 61-66.

Claims 74 and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dujari et al. (US 6,486,589) in view of Verheyen et al. (US 5,130,598). Given the invention of Dujari et al. as noted above, they fail to show the electrical structure of their resonant circuit thus it is unknown whether or not it includes at least one capacitor or includes at least one inductor.

Verheyen et al. show a resonant circuit including at least one capacitor (e.g. C1) and at least one inductor (e.g. L1).

Verheyen et al. do not show a system for at least partially suppressing a vibration of a mechanical disturbance.

It would have been obvious to one having ordinary skill in the art to employ a known resonant structure circuit, such as that shown in figure 1 of Verheyen et al. in the device of Dujari et al. at the time their invention was made in order to avoid costs associated with redesign, and because with this design a voltage doubling effect is achieved. See col. 1, ll. 33-37.

Claims 77 and 85 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dujari et al. (US 6,486,589) in view Futami et al. (US 5,079,493). Given the invention of Dujari et al. as noted above, it is unknown what method is employed by the controller.

Futami et al. note a controlling that employs a method selected from the group consisting of: rate feedback, positive position feedback, **position-integral-derivative feedback (PID)**, linear quadratic Gaussian (LQG) control, model-based control, a dynamic compensator-based control, and a combination thereof in their piezoelectric dviving system.

Futami et al. do not show a system for at least partially suppressing a vibration of a mechanical disturbance.

It would have been obvious to one having ordinary skill in the art to employ the PID system in the controller in the device of Dujari et al. at the time their invention was made because the PID controller is able to take inputs concerning desired action and

actual action, therefore use of such would allow fine driving adjustments. See the discussion of figure 14 at col. 8, ll. 40-57.

Claims 78-81 and 86 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dujari et al. (US 6,486,589) in view Gipson et al. (US 5,900, 690). Given the invention of Dujari et al. as noted above, the behavior of the disturbance measured includes a frequency of the vibration. See col. 4, ll. 43-51.

The behavior of the disturbance includes a frequency of the vibration. See col. 4, ll. 43-51.

The behavior of the disturbance includes a phase of the vibration. Note that Dujari et al. discuss determination of the phase "can be derived by one skilled in the art of control system theory." Col. 3, ll. 62-63.

The electrical energy supplied to the transducer (104, 106) includes a voltage supplied (from 204, 206) to the transducer (104, 106).

With the Dujari et al. invention, it is unknown if the controlling includes adjusting a duty cycle of the at least one of the at least one active switch, to configure the transducer for at least approximately matching a behavior of the disturbance.

Gipson et al. note in their transducer control circuit that controlling includes adjusting a duty cycle of the drive signal, thereby adjusting the energy level of the drive signal.

Gipson et al. do not show a system for at least partially suppressing a vibration of a mechanical disturbance.

It would have been obvious to one having ordinary skill in the art to employ a means to adjust the duty cycle of the drive signal in the device of Dujari et al. at the time their invention was made in order to precisely control the energy supplied and to change that energy value, such as is taught by Gipson et al. at col. 4, ll. 37-46.

Claim 83 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dujari et al. (US 6,486,589) in view Kamens (UD 5,493,543). Given the invention of Dujari et al. as noted above, he doesn't note what type of amplifier he is employing.

Kamens notes use of an amplifier circuit wherein the amplifier circuit is selected from the group consisting of: a switching amplifier, a switched capacitor amplifier, a **capacitive charge pump** (see title), an H-bridge amplifier, a half-bridge amplifier, and a combination thereof, in his drive circuit for a piezoelectric transducer.

Kamens does not show a system for at least partially suppressing a vibration of a mechanical disturbance.

It would have been obvious to one having ordinary skill in the art to employ the capacitive charge pump amplifier in the device of Dujari et al. at the time their invention was made, such as the circuit by Kamens, because this is a known circuit, therefore requiring no design costs and because the circuit provides a high voltage output with a minimum number of components, as noted by Kamens at col. 4, ll. 5-9.

Claims 87 and 88 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dujari et al. (US 6,486,589) in view of Reed (US 5,033,496). Given the invention of Dujari et al. as noted above, they don't show details of their electrical circuit, thus it is unknown whether or not it includes a rectifier circuit.

Reid shows (fig. 1) an electrical circuit including a rectifier circuit (40) wherein the rectifier circuit (40) is coupled to a transducer (44).

Reid does not show a system for at least partially suppressing a vibration of a mechanical disturbance.

It would have been obvious to one having ordinary skill in the art to employ the rectifier circuit of Reid in the device of Dujari et al. at the time their invention was made because this allows for a DC voltage to be applied thereby allowing manipulation of pulses to the piezoelectric transducer.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Other prior art cited reads on some aspects of the claimed invention.

Direct inquiry concerning this action to Examiner Dougherty at (571) 272-2022.

tmd
tmd

May 19, 2004

Thomas M. Dougherty
THOMAS M. DOUGHERTY
PRIMARY EXAMINER
GROUP 2100